

# CLAIMS

1. A magnetic thin film, characterized in comprising an iron nitride thin film formed on a substrate using an opposed-target DC sputtering method by means of reactive sputtering with N<sub>2</sub> gas.

2. A magnetic thin film, characterized in that iron ( $\alpha$  - Fe) thin films and iron nitride thin films are alternately deposited on a substrate by means of an opposed-target DC sputtering method.

3. A magnetic thin film manufacturing method comprising a manufacturing method for iron nitride thin films employing an opposed-target DC sputtering method, characterized in that Ar and N<sub>2</sub> gases are introduced into a film formation chamber, DC power is applied to an iron target in the Ar and N<sub>2</sub> gas atmosphere, and an iron nitride thin film is formed on a substrate.

4. A magnetic thin film manufacturing method in accordance with claim 3, characterized in that a flow rate of said N<sub>2</sub> gas is within a range of 8 - 25% with respect to the total gas flow rate.

5. A magnetic thin film manufacturing method in accordance with one of claims 3 and 4, characterized in that the electron temperature during the formation of the iron nitride thin film is within a range of 0.01 - 1 eV, and the electron density is within a range of  $1 \times 10^9$  -  $1 \times 10^{10}$  cm<sup>-3</sup>.

6. A magnetic thin film manufacturing method in accordance with one of claims 3 through 5, characterized in that said substrate has an iron ( $\alpha$  - Fe) thin film (001) surface formed thereon as a base layer.

7. A magnetic thin film manufacturing method in accordance with one of claims 3 through 6, characterized in that after iron nitride thin film formation, heat treatment is conducted in a vacuum.

8. A magnetic thin film manufacturing method in accordance with claim 7, characterized in that the conditions of said heat treatment are such that the temperature is within a range of 100 - 180° C, and treatment is conducted for a period of time within a range of 1 - 3 hours.

9. A magnetic thin film manufacturing method in accordance with one of claims 3 through 8, characterized in that said iron nitride thin film contains an  $\alpha''$  crystalline phase ( $\text{Fe}_{16}\text{N}_2$ ).

add  
 $\alpha'$

add  
B2